

VERA

A tropical disturbance, north of the climatologically favored area, was first evident on satellite imagery and JTWC's synoptic gradient level analysis at 260000Z July 77 with a cyclonic surface circulation center near 25.5N-133.6E. Exhibiting westward movement over the next 24 hour period, the disturbance gained organization and potential for significant development. At 270500Z, a formation alert was issued. By 271800Z the surface circulation reflected 30 kt (15 m/sec) of wind at the surface and JTWC's initial warning on the system as Tropical Depression 07 (TD 07) was issued at 280000Z. Subsequent post-storm analysis revealed that TD 07 had reached 35 kt (18 m/sec) intensity (minimum tropical storm intensity) by initial warning time.

Beginning as far back as 220000Z, a low cell imbedded in a tropical upper tropospheric trough (TUTT) had formed to the northeast of TD 07's initial warning position. Tracking west-southwest, this upper cell was centered near 30.5N-131.0E at 260000Z. The TUTT, now nearly east-west oriented, continued to dig toward the west and at the same time an upper level anticyclone over Korea/Japan north of this TUTT built eastward. The 200 mb winds at stations along the east coast of Japan reflected 60-75 kt (31-39 m/sec) out of the north-northeast. By 271200Z the TUTT cell was centered near 27.8N 133.5E with strong diffluence southeast of the cell located over the surface disturbance (Fig. 4-3). The vertical coupling had thus been effected and the necessary conditions for tropical cyclone development fulfilled.

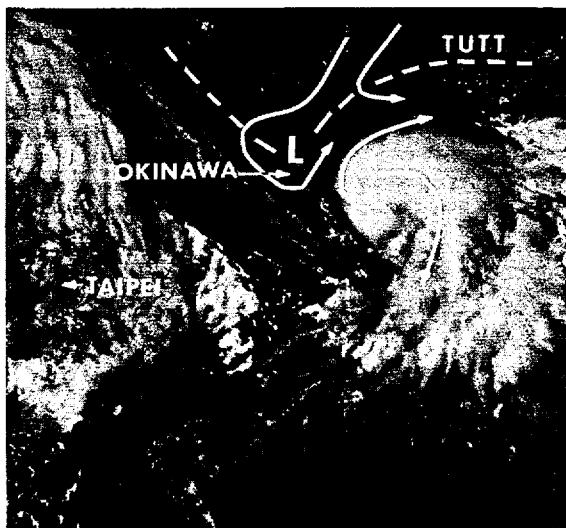


FIGURE 4-3. Vera at barely 40 kt (21 m/sec) intensity showing strong diffluence aloft to the southeast of a TUTT low, 28 July 1977, 0039Z. [NOAA-5 imagery]

By 280000Z, then, TD 07 was upgraded to a tropical storm and named Vera. A generally westward track (260°) at 3 kt (5.6 km/hr) was observed. Steering at this point seemed to be governed by the easterly flow on the southern periphery of the major anticyclone over Korea/Japan. The TUTT low also moved westward. By 291200Z the anticyclone over Korea/Japan began to build toward the southwest in advance of Vera. Therefore, steering influences were reflected in the observed west-southwest (becoming southwest) track that Vera assumed. As she proceeded south-westward, Vera continued to intensify attaining 65 kt (34 m/sec) by 291200Z. From 291200Z to 291800Z Vera intensified from 65 to 90 kt (34 to 46 m/sec) proceeding to the southwest at 9 kt (17 km/hr). Beyond 291800Z a marked decrease in forward speed was noted (from 9 to 4 kt [17 to 7.4 km/hr]) as the northeasterly steering at upper levels appeared to relax. Simultaneously, an increase in intensity occurred. By 300600Z Vera had attained winds of 100 kt (52 m/sec) and satellite imagery revealed a well-defined eye (Fig. 4-4) while reconnaissance aircraft reported 100 kt (52 m/sec) at the 700 mb flight level. By 301200Z satellite data showed improved outflow channels aloft to the west and north and fix positions from radar, satellite, and aircraft supported a more west-northwestward track.

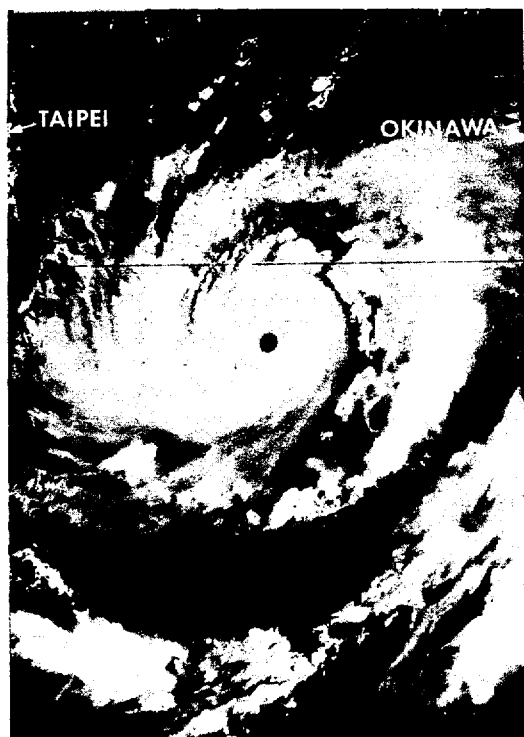


FIGURE 4-4. Typhoon Vera 200 nm (370 km) east of Taiwan and accelerating northwestward.

Upon making her turn to the west-north-west, it became evident that Vera would likely pass directly over Iriomote-Jima and just to the south of Ishigaki-Jima. Figure 4-5 shows the one-hourly surface reports from Ishigaki-Jima (WMO 47978) and indicates eye passage south of the island between 302100Z and 302200Z. Maximum winds reported were from the southeast at 103 kt (53 m/sec) at 302200Z (Fig. 4-6). Minimum pressure reported was 935.6 mb at 302100Z. As Vera

passed south of Ishigaki-Jima, her speed had increased to 10 kt (19 km/hr). Post-analysis revealed that Vera attained her maximum intensity of 110 kt (57 m/sec) by 310000Z (Fig. 4-7) and decreased in intensity slowly thereafter as she approached Taiwan at a speed of 11 kt (20 km/hr) (Fig. 4-8). Aircraft reconnaissance at 310850Z verified a slight intensity decrease as low level inflow channels were restricted by the island of Taiwan.

<div><div>TIME Z</div><div>STATION</div></div>		FWC/JTWC GUAM												DATE
														30-31 JULY 1977
		30/17	30/18	30/19	30/20	30/21	30/22	30/23	31/00	31/01	31/02	31/03	31/04	
47918 ROIG ISHIGAKIJIMA		<div>▽ 4 777</div>	<div>▽ 4 736</div>	<div>▽ 4 668</div>	<div>▽ 5 571</div>	<div>▽ 356 9</div>	<div>▽ 483 4</div>	<div>▽ 705 5</div>	<div>▽ 770 8</div>	<div>▽ 817 8</div>	<div>▽ 853 0</div>	<div>▽ 892 8</div>	<div>▽ 914 0</div>	
		○	○	○	○	○	○	○	○	○	○	○	○	

FIGURE 4-5. Hourly surface synoptic observations from Ishigaki-Jima during passage of Typhoon Vera.

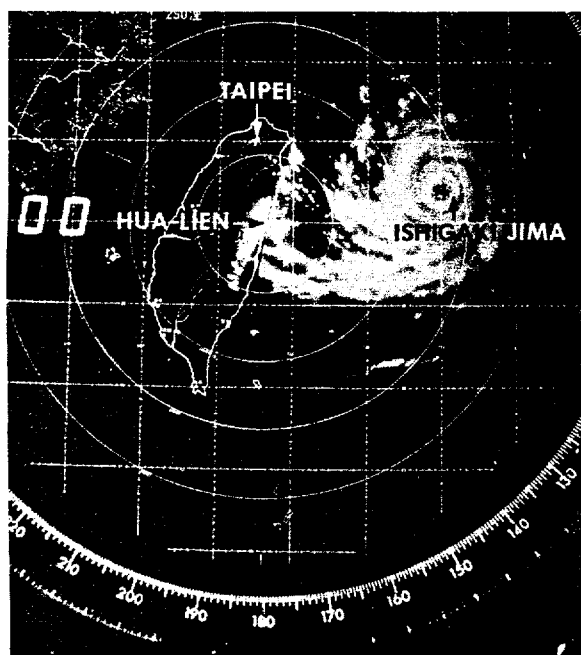


FIGURE 4-6. Hua-Lien radar presentation of Typhoon Vera when Ishigaki-Jima was receiving maximum sustained winds of 103 kt (53 m/sec), 30 July 1977, 2200Z. (Photograph courtesy of the Central Weather Bureau, Taipei, Taiwan, Republic of China.)



FIGURE 4-7. Typhoon Vera at maximum 110 kt (57 m/sec) intensity and just 19 minutes after the radar imagery in Figure 4-6, 30 July 1977, 2219Z. (DMSP imagery)

Landfall on the island of Taiwan occurred at Keelung (Chi-Lung) at the mouth of the Chi-Lung Ho River basin. Moving at 11 kt (20 km/hr) Vera followed the river basin to the west-southwest toward Taipei. Keelung recorded a minimum low pressure of 939.9 mb at 310930Z and a total rainfall of 7.95 in (202 mm). Maximum winds recorded at the Chinese Weather Bureau office in downtown Keelung were 66.6 kt (34 m/sec) with gusts to 113 kt (58 m/sec) at 311030Z. In Taipei, a minimum pressure of 951.5 mb was recorded at 311028Z with total rainfall recorded as 8.0 in (203 mm). Taipei International Airport reported maximum winds of 64 kt (33 m/sec) with gusts to 96 kt (49 m/sec). Both Keelung and Taipei established new records in observed maximum wind reports with Vera's passage. After passing over the northeastern part of Taipei

city, Vera continued on a nearly westward track and emerged in the Taiwan Straits just north of Hsin Chu at 311500Z. Vera continued on a westward track at 11 kt (20 km/hr) and made landfall on the China mainland near Ch'uan-Chou at 010100Z August with an intensity of 80 kt (41 m/sec).

Following so closely after Typhoon Thelma, which had wreaked havoc on the southern portion of Taiwan, Typhoon Vera left at least 25 dead in her wake and vast amounts of property and crop damage. Two ships sank, 10 went aground, 3 were washed away, and 22 were damaged. However, with timely warnings and the occurrence of Thelma two weeks prior, most ships diverted and rode out the storm in the safety of the open sea.

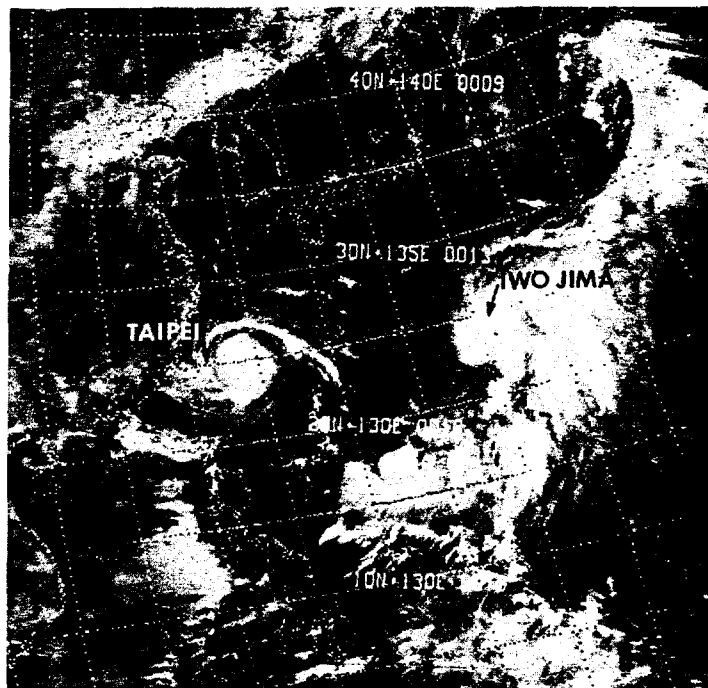


FIGURE 4-8. Typhoon Vera approaching northern Taiwan, 30 July 1977, 2352Z. The next cyclone, Tropical Storm Wanda, is shown at development stage with 30 kt (15 m/sec) winds 100 nm (185 km) south of Iwo-Jima. (NOAA-5 imagery from FLEWEAFAC Suitland, MD)